To:
The Honorable John Zaozirny
Minister of Energy and Natural Resources
Edmonton

The Honorable Patricia Carney
Minister of Energy, Mines and Resources
Ottawa

Honorable Ministers:

We have the honor to present the Annual Report for the fiscal year ending March 31, 1985, relating to the **Alberta/Canada Energy Resources Research Fund Agreement.**

Respectfully submitted,

K. Whitham
Co-Chairman, Alberta/Canada Energy Resources Research Fund

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Co-Chairman, Alberta/Canada Energy Resources Research Fund

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INTRODUCTION

The Alberta/Canada Energy Resources Research Fund (A/CERRF) was created as a result of the March 1974 agreement between the producing provinces and the Government of Canada to hold the wellhead price of domestic crude oil at $6.50 per barrel from April 1, 1974, to June 30, 1975.

In recognition of Alberta's agreement to sell its crude oil below international prices, the federal government committed itself to provide increased funds to assist in strengthening and diversifying the Alberta economy. Of $144 million committed by the federal government, $96 million was directed at energy-related research projects.

The purpose of A/CERRF is two-fold: to promote and support the development and efficient use of Alberta's existing and potential energy resources to meet the province's and Canada's medium- and long-term energy needs; and to encourage the development of scientific and technical expertise in energy research, development and demonstration in Alberta.

Program guidelines used to assess project proposals include the following:

1. The A/CERRF program includes research, development and demonstration of both renewable and non-renewable (fossil fuel) resources, generally excluding oil sands and heavy crude oil.
2. Eligible research, development and demonstration projects relate to exploration, production, transportation, conservation and utilization of Alberta's energy resources. Current areas of importance are research, development and demonstrations related to coal and energy conservation and renewable energy.
3. Preference is given to applied or mission-oriented research projects, although some consideration is given to funding appropriate basic research projects.
4. As much as possible, preference is given to projects using scientific and engineering expertise in Alberta.
5. The private sector in Alberta is encouraged to participate directly in the program through submission of appropriate research, development and demonstration proposals and through representation on specific project management and technical advisory committees.
6. Approved projects are carried out under a legal agreement between Alberta Energy and Natural Resources and the project participants, specifying the terms and conditions under which the research funds will be spent and the technology disclosed, owned and licensed.

Since its establishment in 1976, the program has been refined and developed under the management of the Alberta/Canada Energy Resources Research Fund Committee. A summary of the program from December 1, 1976 to March 31, 1984, was published with the Eighth Annual Report for the fiscal year 1983/84. This 1984/85 Annual Review highlights the research activities for the period April 1, 1984, to March 31, 1985.

The members of the Alberta/Canada Energy Resources Research Fund Committee in 1984/85 were R. D. McDonald (Co-Chairman), G. T. Page and I. Burn for Alberta, and K. Whitham (Co-Chairman), P. J. Dyne, and T. D. Brown for Canada.

Administrative support for the A/CERRF program is provided from Alberta Energy and Natural Resources, Scientific and Engineering Services Division, under the direction of Mr. Juergen K. Kleta, Manager, A/CERRF Secretariat.

PROGRAM HIGHLIGHTS

ENERGY CONSERVATION AND RENEWABLE ENERGY

The emphasis of the projects undertaken in the area of energy conservation and renewable energy focused on the development and demonstration of new technologies in three subprograms:
- General Energy Conservation
- Energy Conservation in Buildings
- Wind Energy

A total of 27 projects were supported. Within the **General Energy Conservation** subprogram, Bow Valley Research Ltd., of Calgary completed the remaining component of the successful Energy Conservation in Sour Gas Processing Project. This multi-year project not only increased the company's knowledge base but has also expanded significantly the company's commercial opportunities.

The **Energy Conservation in Buildings** subprogram accounted for 50% of the total research expenditures and over 80% of the total projects. It focuses on demonstrating the technical feasibility and economic potential of various techniques related to building construction, retrofit insulation, space heating, air leakage and energy management and control systems. A major feature of these projects is that costs are shared between the government and the private sector.

Three projects were supported in **Wind Energy**. In co-operation with Alberta Agriculture and with assistance of the Alberta Research Council, the first three-year demonstration of small-scale wind turbines at Lethbridge was completed successfully. A further three-year period has been approved.

Deltx Windpump-Corporation, Calgary, continued to develop the delta-blade wind turbine technology for water pumping applications. With funding contributions from A/CERRF and the National Research Council, Ottawa, the 16-metre-diameter prototype turbine was tested, and design improvements were made. The company continues to vigorously pursue commercialization.

The Alberta Research Council continued to offer information services through the Solar and Wind Energy Research Program Information Centre and has completed the Solar and Wind Energy Monitoring Program. The monitoring data are being analysed.

A new subprogram for **Waste Heat Recovery/Low Temperature Heat Utilization Research, Development and Demonstration** was approved in 1985/86. This subprogram, modelled on the highly succesful Energy Conservation in Buildings subprogram, has been developed in close co-operation with representatives from industry, academia and government.

Further details of the projects can be found in *Energy Conservation and Renewable Energy Research, Development and Demonstration Annual Review 1984/85* (ENR No. I/138).

COAL

Fiscal year 1984/85 was the first full year of operation of the Alberta Office of Coal Research and Technology established, in part, to administer the A/CERRF-funded coal research projects.

The Alberta Coal Research Strategic Plan was prepared in close cooperation with the Alberta coal industry to provide a framework for guiding new research and development activities. Its goals are to enhance the competitiveness of Alberta coals, to reduce the environmental impact of coal production and utilization and to develop new uses for coal.

The coal industry is expected to take the lead in initiating new projects. These will be jointly funded by in-

dustry and government. Five new projects emphasizing cost efficiency and quality improvement were approved, and two ongoing projects were redirected.

The major effort at the Alberta Research Council to assess the relative reactivities of Alberta subbituminous coals under various coal liquefaction and pyrolysis processes led a private company to plan a major coal liquefaction project based on co-processing of coal and heavy oil.

A restructuring of the Coal Mining Research Company to expand its research base and more carefully focus its research efforts on the coal industry's needs was initiated.

A Coal Research Grants Application Program was established to encourage scientific excellence in fundamental research. Seven research projects were approved for funding in 1985/86.

Details of the various coal research projects are found in *Alberta Office of Coal Research and Technology Annual Review 1984/85* (ENR No. I/134).

CONVENTIONAL ENERGY RESOURCES

Experimental work on the four projects in the Conventional Energy Resources area was completed although the final technical reports were received after March 31, 1985.

Enhanced Recovery of Conventional Crude Oil
Petroleum Recovery Institute, Calgary

The modest expenditures were used to complete the assembly and to test specialized equipment for the institute's Calgary laboratories. Future funding for research projects will be provided from the oil industry, the Province of Alberta through AOSTRA and the Government of Canada. The research programs and technical advisory committees have been revised to more directly respond to industry's research needs.

Hydrocarbon Research
Hydrocarbon Research Centre Inc., Edmonton

The Hydrocarbon Research Centre, located within the University of Alberta, conducts fundamental studies on Alberta fossil fuel resources. Investigations are aimed at a better understanding of these resources and development of improved techniques for their recovery. The Centre also provides research training for university and postgraduate students.

Eight projects were conducted under this program during 1984/85. The coal-based projects are reported in *Office of Coal Research and Technology Annual Review 1984/85.* (ENR No. I/134). The highlights of the remaining four projects follow:

Chemical Flooding Processes for Oil Recovery
S.M. Farouq Ali

Test facilities were constructed to study new approaches for tertiary oil recovery from depleted conventional oil reservoirs and for the development of new strategies for the recovery of heavy oil using carbon dioxide and slugs of brine. This project is complete.

Polar Fractions of Petroleum by Field Ionization Mass Spectroscopy
O.P. Strausz, J.D. Payzant

A better understanding of the chemistry of oxygen, nitrogen and sulphur present in Alberta's coal, heavy oil and bitumen resources is important to guide the development of new technology to process these resources. In this project, now complete, new analytical methods have been developed to determine the different types of sulphur bonding that are present in these materials.

Gas Treating Technology
F.D. Otto, A.E. Mather

The solubility of H_2S, CO_2, CH_4 and C_2H_6 in four solvents which could prove useful for the purification of natural gas and synthesis gas, was determined experimentally. In addition the solubility of hydrocarbons in the chemical solvents now used for removal of H_2S and CO_2 from natural gas was measured. The resulting data base should prove useful for guiding the choice of solvents for sour gas processing and for future research directions. This project has been completed.

Foreign Atom Removal
O.P. Strausz, I. Safarik, T. Yokota

A critical review of the literature of hydrogen atom reactions with sulphur compounds revealed that the reaction mechanism, even with simple molecules such as methanethiol and ethanethiol, is not well understood. Consequently the original research plan to examine the more complicated chemistry associated with heterogeneous catalytic hydrodesulphurization of petroleum products was redirected to examine the reaction of hydrogen atoms with ethanethiol. The results show that the reaction proceeded through a series of free radical mechanisms which could also lead to polymerization of dimers. The results will be published in the *Reviews of Chemical Intermediates Journal*.

Pipeline Leak Detection
Reconaissance Air Ltd., Whitecourt

Gas pipelines must be regularly patrolled and inspected to identify and repair gas leakages. A novel airborne infrared imaging technique was assessed and found to identify cold spots as small as 20 cm by 30 cm along a gas pipeline. A simulated leak equivalent to an actual leak from a 6.4-mm crack in a gas trunk pipeline was also located. The company is proceeding to identify commercial opportunities.

Investigation of Groundwater Flow and Petroleum Occurrences in Alberta
University of Alberta, J. Toth, Edmonton

The hydrogeological approach to petroleum exploration is based on the theory that petroleum is transported by groundwater. This study examined the groundwater flow regimes in the Taber area. While near-surface groundwater flow follows modern topography, more deeply buried groundwater appears to reflect earlier flow patterns that existed during Oligocene and Miocene times. Oilfields in the Taber area are located at what appears to be discharge regions of this earlier flow pattern, adding further support for the hydraulic theory of petroleum migration.

RESEARCH BUILDINGS

The construction of the Devon Coal Research Centre was completed. Staff from various research groups moved into the complex and began installing their equipment. This centre provides a world-class laboratory for coal-related research and pilot-scale testing of new processes.

FINANCIAL STATEMENT

As part of the November 1976 agreement between the Prime Minister of Canada and the Premier of Alberta to fund energy resources research, $96 million has been transferred to the province. The transferred funds were deposited to the General Revenue Account of Alberta Treasury and subsequently made available to projects approved by the Alberta/Canada Energy Resources Research Fund Committee.

The Financial Statement shows the amounts transferred to, and expended by, the approved projects from April 1, 1984, to March 31, 1985. Funds transferred to projects totalled $6 744 814 against expenditures of $6 751 487. Unexpended balances must be applied against projects approved for 1985/86 or be returned to the Alberta Treasury.

Total program expenditures from the beginning of the program in 1976 until March 31, 1985, were $67 512 359. Distribution of expenditures between the various program priorities is shown in Figure 1.

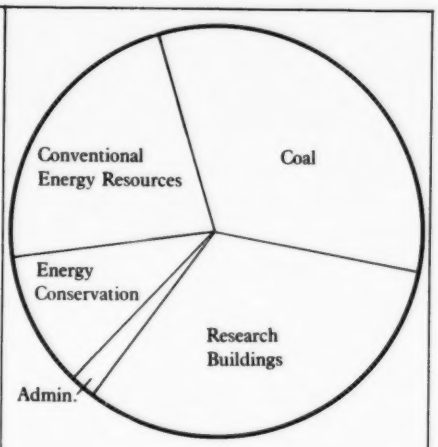

Figure 1: A/CERRF Program Funding Distribution (December 1, 1976, March 31, 1985)

	Funding ($)	Percentage (%)
Energy Conservation and Renewable Energy	7 290 823	10.8
Coal	21 876 308	32.4
Conventional Energy Resources	15 156 228	22.5
Research Buildings	22 154 796	32.8
Administration	1 034 204	1.5
TOTAL	67 512 359	100.0

FINANCIAL STATEMENT

SUMMARY OF TRANSFERS TO AND EXPENDITURES BY APPROVED PROJECTS FROM APRIL 1, 1984, TO MARCH 31, 1985

Projects	Balance Brought Forward from 1983/84	Transferred[a]	Expended[b]	Balance[c]
ENERGY CONSERVATION AND RENEWABLE ENERGY PROJECTS				
An Advanced Control Approach for Solar Heating Systems	540[e]	-	540	-
Laser Fusion Energy Research	(14 699)	14 699[d]	-	-
Energy Conservation in Sour Gas Processing	-	131 399	131 399	-
Edmonton Energy Conservation Centre	-	46 728	51 920	(5 192)
Self-Help Retrofit Manual for Owners of Multi-Family Housing Units	(174)	11 525	12 806	(1 455)
Retrofit Wall Systems for Residential Housing	(34)	2 286	2 540	(288)
Energy Savings and Payback of Retrofit Basement Wall Insulation	(50)	7 591	8 435	(894)
Energy Efficient Housing Display Program	1 670	-	1 670	-
Townhouse Retrofit Demonstration	(648)	9 944	11 048	(1 752)
A Survey of Air Leakage in Alberta Homes	(1 571)	36 064	40 071	(5 578)
Construction and Testing of a Masonry Module	(993)	13 713	14 750	(2 030)
Concrete Masonry Walls for Thermal Storage, Heating and Insulation	(586)	9 396	10 440	(1 630)
Sizing of Warm Air Furnaces for Residential Use	(319)	446	127	-
Development of Higher Efficiency Gas-Fired Furnaces	(438)	32 061	35 624	(4 001)
Seasonal Efficiency of Residential Natural Gas Furnaces	-	32 085	20 261	11 824
Development of an Insulating Curtain for Residential Installation	(804)	23 325	25 917	(3 396)
Residential Air-to-Air Heat Exchanger Using Heat Pipe Technology	(95)	5 371	5 967	(691)
Energy Conservation in Public Swimming Pools	(997)	18 212	20 236	(3 021)
Development of a User-Friendly Computerized Building Management System	(493)	33 553	37 281	(4 221)
Multi-Zone Setback Thermostat	(836)	25 698	28 553	(3 691)
A New Heat-Conserving Control System for Warehouse-Type Buildings	(354)	16 014	17 782	(2 122)
Demonstration of a Cost-Effective Energy Management System	(843)	7 523	8 359	(1 679)
A Ventilation Control System Based on Carbon Dioxide Levels	(60)	810	750	-
Inventory of Building Design and Analysis Computer Programs and a Weather Input Data Base for Alberta	(148)	34 452	35 681	(1 377)
Energy-Efficient Fluorescent Lighting Ballast	(1 957)	27 335	30 372	(4 994)
Computer Simulations for Mechanical Systems in Buildings	(889)	25 096	27 885	(3 678)
Demonstration and Testing of Small-Scale Wind Turbines	-	34 408	34 408	-
A Large Delta-Blade Wind Turbine, An Alberta Development	17 517	9 777	35 294	(8 000)
Solar and Wind Energy Research	(8 191)	255 030	230 179	16 660

FINANCIAL STATEMENT

Projects	Balance Brought Forward from 1983/84	Transferred[a]	Expended[b]	Balance[c]
COAL PROJECTS				
Surface Geophysical Coal Exploration	-	87 224	96 915	9 691
VLF Geophysical Methods in Coal Exploration	-	3 983	4 426	(443)
Coal Mining Research	15 690	337 250	278 838	74 102
Creep Characteristics of Coal	656	-	2 020	(1 364)
Coal Preparation Research	66 889	1 437 750	1 188 731	315 908
Agglomeration of Low Rank Alberta Thermal Coals	(13 675)[e]	-	-	(13 675)
Coal Beneficiation Process	-	61 691	68 546	6 855
Combustion of Agglomerated Alberta Coals	-	2 061	2 061	-
ENR-ARC Coal Conversion Research Program	32 028	2 118 629	2 240 729	(154 128)
Coal Liquefaction Feasibility Study	-	81 498	90 553	(9 055)
Coal Slurry Pipeline Research	11 490	147 728	150 333	(14 095)
Coal Technology Information Centre	-	123 537	123 537	-
CONVENTIONAL ENERGY RESEARCH PROJECTS				
Enhanced Recovery of Conventional Crude Oil	-	8 956	8 956	-
Hydrocarbon Research	120 113	-	87 993	32 120
Investigation of Groundwater Flow and Petroleum Occurrences in Alberta	39 393	-	53 088	(13 695)
Thermographic Detection System for Pipeline Leaks	-	40 500	45 000	(4 500)
RESEARCH BUILDINGS				
Devon Coal Research Centre	-	1 429 466	1 429 466	-
Total Projects	170 096	6 744 814	6 751 487	163 423
Administration	-	215 895	215 895	-
Total A/CERRF	**170 096**	**6 960 709**	**6 967 382**	**163 423**

[a] *Fund transferred by the Department of Energy and Natural Resources to contractors for application to projects in accordance with signed agreements.*
[b] *Project expenditure by contractors funded by ERRF transfers. Interest and other revenue amounting to $33 280 have not been included in (a) and expenditures have been reduced by the same amount.*
[c] *Balance of ERRF fund remaining with contractors at March 31, 1985.*
[d] *Transfer of funding holdback following acceptance of final project report.*
[e] *Outstanding funding balance of previously completed project.*

Additional copies of this report are available from:

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Le texte de ce rapport est aussi disponible en français; s'adresser à:

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Detailed information on any projects funded by the Alberta/Canada Energy Resources Research Fund is available from:

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